enough when they chose. In one of the volumes of that interminable romance, the "Satomi Hakkenden"—there are more than fifty volumes—there is a splendid sketch of a bull, the wild boar is not seldom vigorously delineated, and Mr. Anderson gives a spirited and fairly correct drawing of a deer (Pl. 31). The explanation probably is that quadrupeds did not interest the Eastern artist, the chase, save of the wild boar, was little in vogue, and rather discouraged by Buddhism. The human face was regarded generally as a mere accessory, and conventionally rendered. There were exceptions: Kikuchi Yosai drew faces vigorously, though even he seemed to limn a profile with difficulty, and the portrait-sculptors of the seventeenth century displayed considerable power. No attempt whatever seems to have been made to portray human beauty of face or form, and the renderings of female beauty are insipid in the extreme, as well seen in the sketch of an ancient hetaira, somewhat truculently called "Hell" Reigan (Pl. 41). The stronger emotions, however, are delineated with a power that would have delighted Darwin, exemplifying admirably his descriptions of the modes of facial expression of the passions of anger, fear, despair, and horror. In some of the novel-illustrations I have seen disdain, reflection, and slyness admirably portrayed. But the softer sentiments are either not depicted at all, or depicted after a purely conventional fashion. The Turanian countenance is not expressive, save of the stronger emotions. A curious mode of portraying anger is to paint streaks of red round the eyes and along the principal lines of expression, nor is the device altogether ineffectual. The Japanese flush with anger, but not with shame; indeed, the feeling of shame they seem to possess but in a minor degree. In some other particulars their modes of expression are peculiar. They nod assent (*unadzuki*), but do not shake their head in dissent. They talk without gestures and with little emphasis of accent, but with curious changes of note and intonation. They never kiss; mothers even do not kiss their children, and they have singularly few terms of endearment. By way of compensation they have few terms of abuse, and no oaths. Their individuality is small, reflected in the curious impersonality of their language (see some excellent remarks on this characteristic by Mr. Aston, *Tr. R. As. Soc.*, vol. xii.); every Japanese is through life a member of a family, or, if a head of a family, a member of some guild or fraternity; he never "paddles his own canoe." Thus may be explained, in great measure, their neglect of humanity in art.

On a future occasion I trust to be allowed to offer a few more remarks on some points in connection with the art of Japan that seem to me interesting in relation to it as a phase in human history. Meanwhile I must not omit a recognition, not the less hearty because necessarily brief, of the value of Mr. Anderson's labours, the extent of which my own studies enable me to appreciate. This is not the place to enlarge upon the artistic merits of his work; they have been, or will be, sufficiently appreciated elsewhere. But the stores of folklore he has gathered together form a contribution to our scientific knowledge of man of extreme importance, and his account of the development of Japanese art is as interesting as it is instructive. The present instalment is admirably got up, and the illustrations, particularly the chromolithographs by Greve of Berlin, are of unsurpassed excellence. Altogether the work promises to be of equal interest and value to the student of man and society, to the lover of art, and to the collector of Oriental curiosities.

F. V. DICKINS

THE EVOLUTION OF THE PHANEROGAMS

L'Évolution des Phanérogames. Par MM. Saporta et Marion. Second Notice. (Paris: Alcan, Boulevard St. Germain, 1885.)

IN our previous notice (vol. xxxii. p. 289) of this important work we traced the evolution of gymnosperms down to a certain point. Prof. Williamson soon afterwards communicated the chief point of difference between his views and those of our authors, in a very interesting letter (NATURE, vol. xxxii. p. 364). We were not able at the time to follow the subject farther, and this was of less consequence, as the points at issue, though extremely important in themselves, are not claimed to be in the direct line of evolution of the existing phanerogams. The palæozoic heterosporous cryptogams, with exogenous stems, are chiefly interesting, from the evolutionary standpoint, for the light they throw on what must probably have been the structure of the common ancestors, from which they, as well as the gymnosperms, were derived. A *résumé* of what is known regarding the ancestry of the Eocene Coniferæ will shortly be published by the Palæontographical Society, the compilation of much of which has been directly assisted by Prof. Williamson himself, and has also been revised in part by Mr. Carruthers. As it is not claimed by Saporta and Marion in any way that angiosperms have been evolutionised from gymnosperms, even through the Gnetaceæ, it is unnecessary to pursue that branch of the subject farther now. The interest of the work centres, in fact, in the attempt to trace the ancestry of the monocotyledons and dicotyledons, groups which to ordinary observers seem to appear with startling abruptness in the geological record.

The differentiation of angiosperms, no less than gymnosperms, originally took place, it would appear, in pre-Carboniferous times, the ancestral forms common to both being heterosporous cryptogams, destitute of exogenous wood. The fundamental difference at starting seems to be that, in the gymnosperms, one of the macrospores contained in the ovule immediately absorbs all the rest, enabling their evolution to proceed with rapidity; while in the angiosperms there is a period of struggle among the macrospores before one finally obtains the advantage and obliterates its fellows. Want of space renders it impossible to give any account of the steps by which the authors have traced out this process. The common source, at a remote period, of the monocotyledons and the dicotyledons, is assumed from the fact that the early stages of the development of the embryo, in some of the former, approach nearer to dicotyledons than to plants of their own class. Moreover, the essential organs, the carpels, stamens, petals, and the fruits, are sufficiently analogous to indicate a common origin. The problem attempted is to reconstruct the "pro-angiospermic" stage whence these two opposite lines have issued. The fully-developed leaves of monocotyledons and dicotyledons embrace many varieties, from the most simple to others

that are immensely complicated. Those of the former are generally of the more simple kind, but in the aroïds and Smilax they equal in complexity, and resemble, dicotyledons. It is not among these, however, but, as in zoology, among the embryonic stages, that the ancestral forms are likely to be traced. In many young plants the first leaves are very different in form and structure to those born when maturity is reached. Examples are given of sheathing, amplexicaul phyllodes in *Cicer aristinium*, *Quercus pubescens*, *Asparagus officinalis*, and some *Rosaceæ*, most of which are scale-like and parallel-veined. In *Aralia nympheæfolia* the stipules embracing the young shoot are of considerable size and adherent for some time. They have a fine parallel venation which scarcely anastomoses and resembles not only the fully-developed leaves of some monocotyledons, but the petals and sepals of many flowers. In *A. Sieboldi* the bracts enveloping the buds and young shoots are similarly constructed, the petiole and true leaf barely emerging from their summit. The sheath, representing the primitive leaf, is in some Umbelliferæ, as the fennel, more important than the secondary leaves, and in one dicotyledon at least, *Eryngium bromeliæfolium*, the latter are not developed at all, the leaves resembling those of a yucca. On the other hand, it is not every monocotyledon that has preserved its primitive leaves only. In *Canna indica*, for example, the inferior and sheathing portion represents the primitive leaf, the middle part, or petiole, the original mucronate apex, and the blade the secondary leaf. Nearer the flower-spike only the primitive leaf-development remains in the form of bracts. The same characters are observed in *Strelitzia regina*. In Aroïdeæ the first leaves are simple and sheathing and the second as complex as those of dicotyledons. *Smilax* furnishes an example of a monocotyledon which has elaborated precisely the same kind of secondary leaf as a dicotyledon. In the grasses the primitive leaf appears on the underground rhizome as a sheath, later reduced to the ligule, while the ribbon-leaf is the homologue of the ordinary dicotyledonous leaf. In palms the primitive leaves are traceable in germination and later in the spathes and bracts, and in an altered condition in the leaf petiole, only the fan part being the secondary leaf.

The ancestral "pro-angiosperms" are supposed to have borne leaves such as are found diminished or masked in so many of their existing descendants—that is, entire, more or less elongated, ribbon-like leaves, amplexicaul at the base, attenuated and mucronate at the apex, and traversed by numerous longitudinal veins, connected by transverse veinlets, or even areolated.

Monocotyledons have, as a class, preserved their primitive foliary appendages more perfectly than dicotyledons, in which they are frequently so reduced as to be barely traceable as lateral expansions of the petiole, or in minute stipules.

The flower is an organ common to both, and must, therefore, have been produced before the two classes had become differentiated. The relative simplicity of structure seen in their several parts is thus explicable—sepals, petals, and bracts being frequently almost reproductions, as to form and venation, of the vagina, or the first sheath leaves, which in many plants succeed the cotyledons, and the terminal mucro can also sometimes be detected. Examples of primitive flowers are seen in *Magnoliaceæ*, *Ranunculaceæ*, and *Nymphaceæ*, but others have doubtlessly been profoundly modified to meet the needs of fertilisation. That the sexual leaves bearing the micro- and macro-sporangia—stamens and pistils—are similarly modified leaves, is also apparent in the case of *Magnolia*. Originally the "pro-angiospermic" flower must have consisted of an axis bearing the sexual appendages spirally disposed one above another, the microsporangial leaves at the base, and the ovule-bearing ones above. Though the flower has became consolidated through the shortening of the axis, its primitive spiral arrangement is traceable in a multitude of angiosperms.

Even the stems in the two classes are not really fundamentally different, the permanent presence or the absence of a productive region of cambium alone sufficing to have originated the two divergent types. In the remote past, before even the seasons were well defined, the cambium layer may have existed in an irregular or fugitive manner in the "pro-angiospermic," as it did in the "pro-gymnospermic" stem, and thence increasing differentiation have produced the two parallel series forming respectively at last dicotyledonous and monocotyledonous stems. Branching probably took place in such primordial stems by means of solitary terminal buds, accompanied perhaps by a restricted number of lateral ones, after the fashion of the screw-pines, aroids, and aloes.

Such was the nature of plants in their "pro-angiospermic" stage. Even the initial difference in the number of cotyledons characterising each class is explicable by supposing them to have been originally of unequal size, and that progressive differentiation led, in the one direction to equalisation, and in the other to suppression. The inequality is preserved in *Nymphaceæ*, which thus serve to diminish the difference in this respect between the two classes.

J. STARKIE GARDNER

OUR BOOK SHELF

A Tangled Tale. By Lewis Carroll. With Six Illustrations by Arthur B. Frost. Pp. 152. (London: Macmillan and Co., 1885.)

THE first half of this delightful book consists of ten chapters, or "knots," as they are labelled by the author. Each of these contains a quaint and humorous description of some romantic episode, imagined in order to furnish occasion for proposing certain ingenious mathematical problems to the younger actors in the drama.

The author states that his intention was to embody these questions in each knot "like the medicine so dexterously, but ineffectually, concealed in the jam of our early childhood." This, however, may be noted: in the several doses presented in the volume before us the patient may assimilate all the jam, and, at will, reject the medicine.

The fun and humour with which these sketches sparkle may be enjoyed—and the many sly hits to be found therein may be appreciated—by those who are unwilling or unable to grasp the mathematical question involved.

And for another class of readers there is furnished, in an appendix which fills the latter half of the book, plenty of strong medicine ready to be taken undiluted, if so they choose.

"A Tangled Tale" having originally appeared as a serial in the *Monthly Packet*, many of the fair readers of that magazine, and also some of their brothers, sent up answers month by month to the questions proposed, and